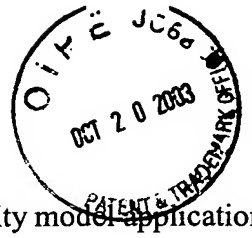

[Utility model application re: Penetration-type socket and its ratchet wrench]

Application Date: February 19, 2001 Case No. 90202569

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(Sections above to be filled in by Bureau)

Utility Model Application

I. Title of design
Chinese: Penetration-type socket and ratchet wrench therefor
English:

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Name of representative (Chinese): 1.
Name of representative (English): 1.

IV. Chinese Abstract (title of design: Penetration-type socket and ratchet wrench therefor)

The present design provides a penetration-type socket and its ratchet wrench therefor including the following: a wrench main body, a ratchet section, a clip body, a socket, and a locking section. The second end of the ratchet section can be placed in the box end of the wrench main body. At that time, the locking section is fixed in the groove at the second end of the ratchet section and the groove in the box end to fix the ratchet section in the box end. The first end of the socket can be placed in the coupling hole of the ratchet section. A clip body is then clipped in the channel of the ratchet section. The two clips of the clip body precisely fit in the groove of the seizing block of the socket so that the socket is clipped by the clip body to be coupled to the ratchet section. The seizing groove on the ratchet section in the box end of the

wrench main body engages with the seizing block of the socket to increase the surface area of contact between the socket and the ratchet ring to produce a relatively high torque during counterclockwise and clockwise rotation. The first end of the ratchet section projects beyond the box end of the head of the wrench and clips into the channel at the first end of the ratchet section with an elastic clip body so that the socket can be coupled to the ratchet section in the coupling hole in a detachable manner. This design can increase the thickness of the second end of the ratchet section so that a relatively high torque can be produced without increasing the size of the head of the wrench. Also, the interior corners of the socket will not become damaged or rounded off by the resistance of the ratchet ring. The engagement between the seizing groove and the seizing block can prevent any slippage and significantly reduce the required size of the head so that the operation can be conducted more quickly and reliably. This design has high utility in its industrial application field.

V. English Abstract (1)

Explanation of the design

Background of conventional technology

Hand tools have played a very important role in people's lives since the dawn of civilization. After bolts were invented, the wrench becomes the most important hand tool. There are many types of wrenches, such as a combination wrench, double open-ended wrench, double box-end wrench, and the ratchet wrench. Since, Taiwan is an island country with limited resources and a small domestic market, international trade is the only means for Taiwan to survive, so that product export is considered very important. Of course, the scientific product market is currently the hottest field. However, this field is very competitive and carries high risks. Therefore, the conventional [tool] industry is still the most stable industrial field. However, since this industry has been developed for a long time, the development potential is now very limited, and survival of the industry faces serious challenges. In order to survive, continuous development of new products is the only option. Consequently, in the current industrial field, it is important to combine various forms and tools to create new forms to increase the additional values of the products and effectively lower manufacturing costs in order to maintain a competitive advantage in a field with limited development opportunities.

Hand tools enjoy a good export market. Only those with products of superior quality, low manufacturing costs, and high rates of fabrication can capture a high share of the export market. Currently, the most important competitive advantage lies in the manufacturing method and process of the hand tools because they have close relationships to manufacturing cost and rates of production. Figure 1 shows a conventional penetration-type socket and ratchet wrench. A polygonal socket (3) is fitted in through-hole (2) in the head of the main body of wrench (1).

Wrench (1) is then turned to drive the socket to turn through the engagement between through-hole (2) and socket (3). In this conventional design, however, since there is only single-point, small-area contact between socket (3) and through-hole (2), the force applied to socket (3) is not distributed evenly, and the stress concentrates on the contact point. When a relatively large torque is applied when turning wrench (1), it is very easy to damage or round off the interior corners of socket (3) due to the resistance of through-hole (2). As a result, socket (3) will become damaged and become useless. Also, in this design, when wrench (1) is turned, a small slippage angle will occur between through-hole (2) and socket (3). If a task is performed in areas with little space, this slippage angle will make the operation more difficult. Turning the handle will becomes harder and more time-consuming, and the torque cannot be completely transferred to socket (3). Figure 2A shows another conventional wrench. In this conventional wrench, the arc-shaped groove (5) in socket (4) engages with the mating projecting block (7) of the ratchet ring (6). However, this engagement of socket (4) and ratchet ring (6) increases the size of the head, making it impossible to use the wrench in confined spaces. Also, if a high torque is applied to this arc-like engagement structure, torque cannot be transferred effectively between the rounded mating surfaces, which tends to cause slippage or loosening between socket (4) and ratchet ring (6). Therefore, this conventional wrench has no commercial value. As show in Figure 2B, which is the structural cross-sectional view of the aforementioned conventional wrench, socket (4) is fixed in ratchet ring (6) with the aid of a C-shaped clip (8) arranged in the center of ratchet ring (6). However, the arrangement of said C-shaped clip (8) in the center forces thinning of the wall surface of ratchet ring (8) [sic; (6)], which leads to a corresponding reduction in the amount of torque that the wrench can withstand. In order to increase the torque resistance of the wrench, it is necessary to increase the thickness of the wall surface of ratchet ring (6). This will increase the area of the head of the wrench. As a result, the wrench completely loses its value in the industrial field. This conventional penetration-type socket and ratchet wrench cannot be used in confined spaces and provides high transmitted torque. Therefore, it is necessary to modify the aforementioned conventional penetration-type socket and ratchet wrench.

In order to solve the aforementioned problem, the present designer developed a practical design based on his many years of experience in the design, manufacturing, and development of hand tools. The design of the "Penetration-type socket and ratchet wrench" disclosed herein was arrived at after many development-and-modification cycles. The special design between the socket and the wrench main body can reduce size of the head. Also, its coupling mechanism makes it a more reliable means of transferring torque, so that very high torques can be transferred without damaging or rounding off corners. Therefore, the present design is very useful and does indeed advance the technology of the industrial field.

Purpose and advantages

The purpose of the present design is to provide a penetration-type socket and ratchet wrench with the following features. The seizing groove of the ratchet section in the box end of the wrench main body engages with the seizing block on the socket to increase the surface area of contact between the socket and the ratchet ring in order to transmit a relatively high torque when the wrench is turned clockwise and counterclockwise. Also, the corners of the socket will not be damaged or rounded off by the resistance of the ratchet ring. The first end of the ratchet section projects beyond the box end of the wrench head and is clipped in the channel in the first end of the ratchet section with an elastic clip body so that the socket can be coupled to the ratchet section in the coupling hole in a detachable manner. This design can increase the thickness of the second end of the ratchet section so that a relatively high torque can be produced without increasing the size of the wrench head. Also, the engagement between the seizing groove and the seizing block can prevent any slippage and significantly reduce the required head size so that tasks can be performed more quickly and reliably. This design is very useful in its industrial field.

Detailed explanation of the design

The technology and means adopted by the present design and its effects will be described below in detail with reference to preferred application examples illustrated in the figures.

Figures 1-11 show various structural features of the application examples of the present design. These figures are for explanation purposes only. The utility model application is not restricted to these features.

The present design provides a penetration-type socket and ratchet wrench, which has the following parts as shown in Figures 4 and 5.

The socket and ratchet wrench include a wrench main body (10). One end of wrench main body (10) is head (11), and the remainder comprises the handle (not shown in the figure). A box end (12) is formed in head (11). An arc-shaped groove (13) is formed in the inner wall surface of said box end (12). A ratchet reversing mechanism (14) can be installed behind head (11) such that the wrench main body (10) has a direction-locking function. Said ratchet reversing mechanism (14) may have a conventional structure, which will not be described here.

The socket and ratchet wrench also have a cylindrical ratchet section (20) with a first end (21) and a second end (22). A coupling hole (23) that penetrates ratchet section (20) is formed in the axial direction through the center of ratchet section (20). Multiple seizing grooves (24) are formed at appropriate intervals on the inner perimeter of coupling hole (23). The bottom surface (241) of each seizing groove (24) can be arc-shaped, while the two flanking sides (242) of each seizing groove (24) are flat. A coupling part (25) is formed at the first end (21) of ratchet section

(20). A channel (251) is formed in one of the two ends in an appropriate place in the periphery of coupling part (25). Said channel (251) is only used for connection to coupling hole (23). A circular toothed part (26) is formed on the wall surface of the second end (22), and a groove (27) is formed at one end of toothed part (26).

The socket and its ratchet wrench also have an elastic clip body (30) that is shaped like [illegible]. The two clips (31) of said clip body (30) are flat and straight. Said clip body (30) can only be clipped in the channels (251) of ratchet section (20).

The socket and ratchet wrench also have a socket (40) with a first end (41) and a second end (42). Multiple seizing blocks (43) that project outwards are formed at appropriate intervals on the outer periphery of the first end (41). The top surface (431) of each seizing block (43) can be an arc-shaped surface, while the two sides (432) of each seizing block (43) form flat surfaces. A groove (44) is formed in the horizontal direction at an appropriate location at one end of each seizing block (43). A through-hole (45) that penetrates socket (40) is formed in the axial direction through the center of the first end (41). A socket hole (46) is formed in the axial direction in the center of the second end (42). Said socket hole (46) is used for fitting over a nut.

The socket and ratchet wrench also have a C-shaped elastic locking section (50), which precisely fit in the groove (27) of ratchet section (20).

During assembly, as shown in Figures 4 and 5, locking section (50) can be fitted the groove (27) at the second end (22) of ratchet section (20). Then, the second end (22) of ratchet section (20) is placed in the box end (12) of wrench main body (10). At that time, the first end (21) of ratchet section (20) projects beyond box end (12). Also, ratchet section (20) is locked by locking section (50) in groove (13) of box end (12) to fix ratchet section (20) in box end (12). The first end (41) of socket (40) is inserted into coupling hole (23) of ratchet section (20). Then, clip body (30) is clipped in channels (251) of ratchet section (20). As shown in Figure 6, the two clips (31) of clip body (30) are precisely fitted in the grooves (44) of seizing blocks (43) of socket (40) so that socket (40) is clipped by clip body (30) to be coupled in ratchet section (20).

During use, as shown in Figure 6, the present design can be applied to turning a nut on a long blot. The long blot can penetrate the socket hole (46) and through-hole (45) of socket (40) to penetrate through and extend beyond wrench main body (10). According to the present design, the seizing grooves (24) of coupling hole (23) on ratchet section (20) engage with the seizing blocks (43) of socket (40) to increase the surface of area contact between socket (40) and ratchet ring (20) to obtain a relatively high torque during counterclockwise and clockwise rotation. Also, the interior corners of socket (40) will not become damaged or rounded off by the resistance of ratchet ring (20). The engagement between seizing grooves (24) and seizing blocks (43) can prevent any slippage and significantly reduce the area of head (11) so that tasks can be completed more quickly and reliably. This design is very useful in its industrial field.

Figure 7 shows a second application example of the present design. In this case, the seizing grooves (24) of ratchet section (20) are slightly rounded. The bottom surface (241) of each seizing groove (24) is formed with an arc surface, while the two flanking sides (242) of each seizing groove (24) are flat. The angle formed by extending the two sides (242) of seizing groove (24) is less than 90°. Also, the shape of the seizing blocks (43) of socket (40) is changed corresponding to seizing grooves (24). The same effects described in the first application example can be realized depending on the type of engagement between seizing grooves (24) and seizing blocks (43).

Figure 8 shows a third application example of the present design. In this case, the seizing grooves (24) of ratchet section (20) are approximately fan-shaped. The bottom surface (241) of each seizing groove (24) is formed as an arc surface, while the two flanking sides (242) of each seizing groove (24) are flat. The angle formed by extending the two sides (242) of seizing groove (24) is less than 90°. Also, the shape of the seizing blocks (43) of socket (40) is changed to correspond to seizing grooves (24). The same effects described in the first application example can be realized depending on the type of engagement between seizing grooves (24) and seizing blocks (43).

Figure 9 shows a fourth application example of the present design. In this case, the seizing grooves (24) of ratchet section (20) are approximately rectangular. The bottom surface (241) of each seizing groove (24) is flat, while the two flanking sides (242) of each seizing groove (24) are also flat. The extensions of the two sides (242) of seizing groove (24) are parallel. Also, the shape of the seizing blocks (43) of socket (40) is changed to correspond to seizing grooves (24). The same effects as described in the first application example can be realized depending on the type of engagement between seizing grooves (24) and seizing blocks (43).

Figure 10 shows a fifth application example of the present design. In this case, the step between the coupling hole (23) of ratchet section (20) and seizing groove (24) in the first application example is changed to a rounded corner. The step between the first end (41) of socket (40) and seizing block (43) is also changed to a rounded corner. The same effects as described in the first application example can be realized depending on the type of engagement between seizing grooves (24) and seizing blocks (43).

Figure 11 shows a sixth application example of the present design. In this case, the groove (13) on wrench main body (10) in the first application example is formed at the bottom of box end (12) so that ratchet section (20) can be installed in the opposite direction in the box end (12) of wrench main body (10). The groove (44) on socket (40) is also formed at the bottom of the first end (41). In this way, when the first end (41) of socket (40) is placed in the coupling hole (23) of ratchet section (20), the socket can be clipped with clip body (30) in the channel

(251) of ratchet section (20). Socket (40) is clipped with clip body (30) to be coupled in ratchet section (20). The same effects as described in the first application example can be realized depending on the type of engagement between seizing grooves (24) and seizing blocks (43).

As described above, the "Penetration-type socket and ratchet wrench" of the present design indeed has a more effective structure than the conventional one. Also, the present design is indeed a very useful design in the industrial field. The advantages of the present design are described below.

1. The "Penetration-type socket and ratchet wrench" of the present design optimizes the engagement between the seizing grooves of the coupling hole on the ratchet section and the seizing blocks of the socket to increase the surface area of contact between the socket and the ratchet ring to produce a relatively high torque during counterclockwise and clockwise rotation. Also, the interior corners of the socket will not become damaged or rounded off by the resistance of the ratchet ring. The engagement between the seizing grooves and the seizing blocks can prevent any slippage and significantly reduce the size of the head so that tasks can be performed more quickly and reliably. This design is very useful in the industrial field.

2. In the "Penetration-type socket and ratchet wrench" of the present design, since the clip body is clipped in the groove on the socket and the two clips of the clip body are straight and flat, the clipping force can be increased to make the socket engage more stably in the ratchet section.

3. In the "Penetration-type socket and ratchet wrench" of the present design, the first end of the ratchet section projects beyond the box end of the wrench head and is clipped in the channel at the first end of the ratchet section with an elastic clip body so that the socket can be coupled to the ratchet section in the coupling hole in a detachable manner. This design can increase the thickness of the second end of the ratchet section so that a relatively high torque can be produced without increasing the size of the wrench head.

Perhaps the Examining Committee regards the structure of the present design as very simple. However, as described in the tenth line on page 2-2-19 of the examination standards published by [illegible] Bureau, "in a field with limited technical developmental opportunities, a small technical improvement should be considered as 'improvement of some effect' if it generates an effect of simplified or practical use." The "improvement of some effect" is also clearly defined as "a utility model pertaining to the shape or structure of an article or modification of a device, which can effectively solve problems of the conventional technology and has the condition of simplified or practical use." Therefore, the present design is indeed an improvement of effect. The purpose of a patent is to encourage constant innovation and design. The present design is very innovative and has created a significant effect in its limited developmental area. Therefore, a patent should be granted to the present design.

As described above, the present design is an advanced and practical design in the industrial field and has not been disclosed in any publication. Therefore, it conforms to regulations 97 and 98 of the Patent Act.

The application examples described are only preferred application examples of the present design and should not limit the scope of the present design. Any change or modification made on the basis of the claims of the present design should be within the scope of the patent of the present design.

Brief description of the figures

After the preferred application examples have been explained with reference to the attached figures for further understanding the effects, characteristics, and purpose of the present design, we believe that the examiners will have a deeper and fuller understanding of the present design.

Figure 1 is a top view illustrating the structure of a conventional wrench.

Figure 2A is a top view illustrating the structure of another conventional wrench.

Figure 2B is the structural cross-sectional view of the conventional wrench.

Figure 3 is a three-dimensional view illustrating the appearance of the present design.

Figure 4 is an exploded three-dimensional view of the present design.

Figure 5 is a cross-sectional view illustrating the structure of the present design.

Figure 6 is the top cross-sectional view of the structure of the present design.

Figure 7 is a top view illustrating the second application example of the present design.

Figure 8 is a top view illustrating the third application example of the present design.

Figure 9 is a top view illustrating the fourth application example of the present design.

Figure 10 is a top view illustrating the fifth application example of the present design.

Figure 11 is a top view illustrating the sixth application example of the present design.

Explanation of the reference symbols

1	Wrench
2	Through-hole
3	Socket
4	Socket
5	Arc-shaped groove
6	Ratchet ring
7	Arc projecting block
8	C-shaped clip
10	Wrench

11 Head
12 Box end
13 Groove
14 Ratchet reversing mechanism
20 Ratchet section
21 First end
22 Second end
23 Coupling hole
24 Seizing groove
241 Top [sic; bottom] surface
242 Side
25 Coupling part
251 Channel
26 Toothed part
27 Groove
30 Clip body
31 Clip
40 Socket
41 First end
42 Second end
43 Seizing block
431 Top surface
432 Side
44 Groove
45 Through-hole
46 Socket hole
50 Locking section

Claims

1. A penetration-type socket and ratchet wrench comprising the following parts:

a wrench main body with a head and handle; a box end that penetrates the head of the wrench in the vertical direction is formed in the head;

a ratchet section with a first end and a second end; a coupling hole that penetrates the ratchet section is formed in the axial direction through the center of the ratchet section; multiple seizing grooves are formed at appropriate intervals on the inner perimeter of the coupling hole; the sides of each seizing groove are flat surfaces; the first end projects beyond the box end of the

wrench head, while the second end can be fitted in the box end of the wrench main body and can turn with respect to the box end;

a socket with a first end and a second end; seizing blocks corresponding to the aforementioned multiple seizing grooves are formed at an appropriate place on the outer periphery of the first end so that the socket can be coupled to the ratchet section in a detachable manner; the sides of each seizing block are flat; a through-hole that penetrates the socket is formed in the axial direction through the center at the first end; a socket hole is formed in the axial direction through the center at the second end; the socket hole is used for fitting over nuts.

2. A penetration-type socket and ratchet wrench comprising the following part:

a wrench main body with a head and handle part; a box end that penetrates the head of the wrench in the vertical direction is formed in the head;

a ratchet section with a first end and a second end; a coupling hole that penetrates the ratchet section is formed in the axial direction through the center of the ratchet section; multiple seizing grooves are formed at appropriate intervals on the inner perimeter of the coupling hole; the first end projects beyond the box end of the wrench head; at least a channel is formed in an appropriate location on the periphery of the first end; this channel is connected to the coupling hole; the second end can be fitted in the box end of the wrench main body and can turn with respect to the box end;

a socket with a first end and a second end; seizing blocks corresponding to the aforementioned multiple seizing grooves are formed at an appropriate location on the outer periphery of the first end; a through-hole that penetrates the socket is formed in the axial direction through the center at the first end; a socket hole is formed in the axial direction through the center at the second end; the socket hole is used for fitting over nuts;

an elastic clip body with at least one straight and flat clip that is clipped in the channel at the first end of the ratchet section and is exposed in a projecting manner in the coupling hole.

3. The penetration-type socket and ratchet wrench described in Claim 1 or 2 characterized by the fact that the angle between the extensions of the two sides of the seizing groove and seizing block is less than 90°.

4. The penetration-type socket and ratchet wrench described in Claim 1 or 2 characterized by the fact that the extensions of the two sides of the seizing groove and seizing block are parallel.

5. The penetration-type socket and ratchet wrench described in Claim 1 or 2 characterized by the fact a toothed part is formed on the wall surface of the second end of the ratchet section, and a groove is formed at one end of the toothed part.

6. The penetration-type socket and ratchet wrench therefor described in Claim 1 or 2 characterized in that the [part] between the coupling hole and seizing groove of the ratchet

section is formed with a rounded corner, and the [part] between the first end and the seizing block of the socket is also formed with a rounded corner.

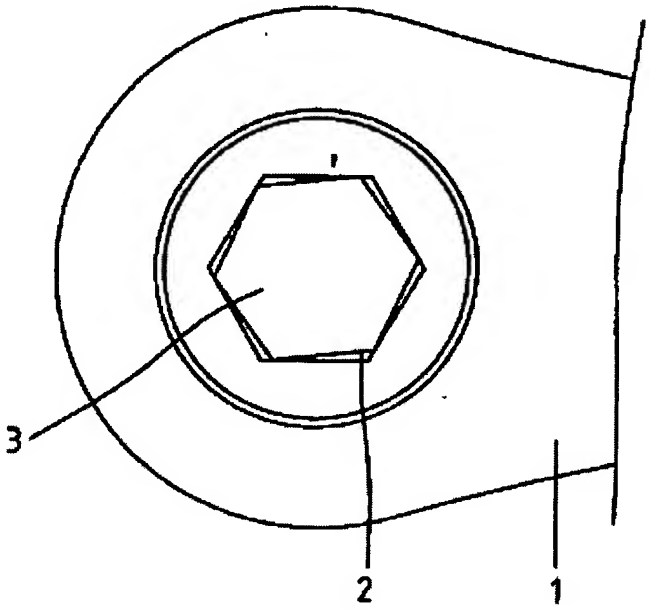
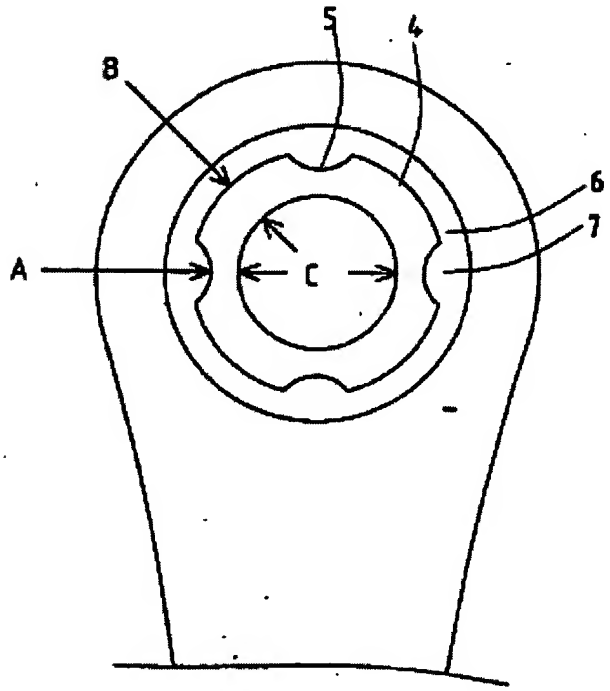


Figure 1



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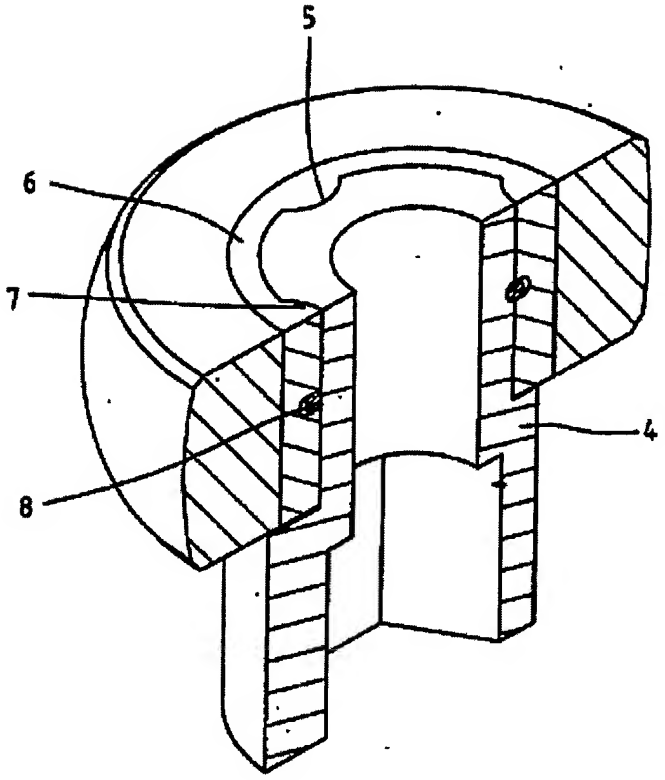

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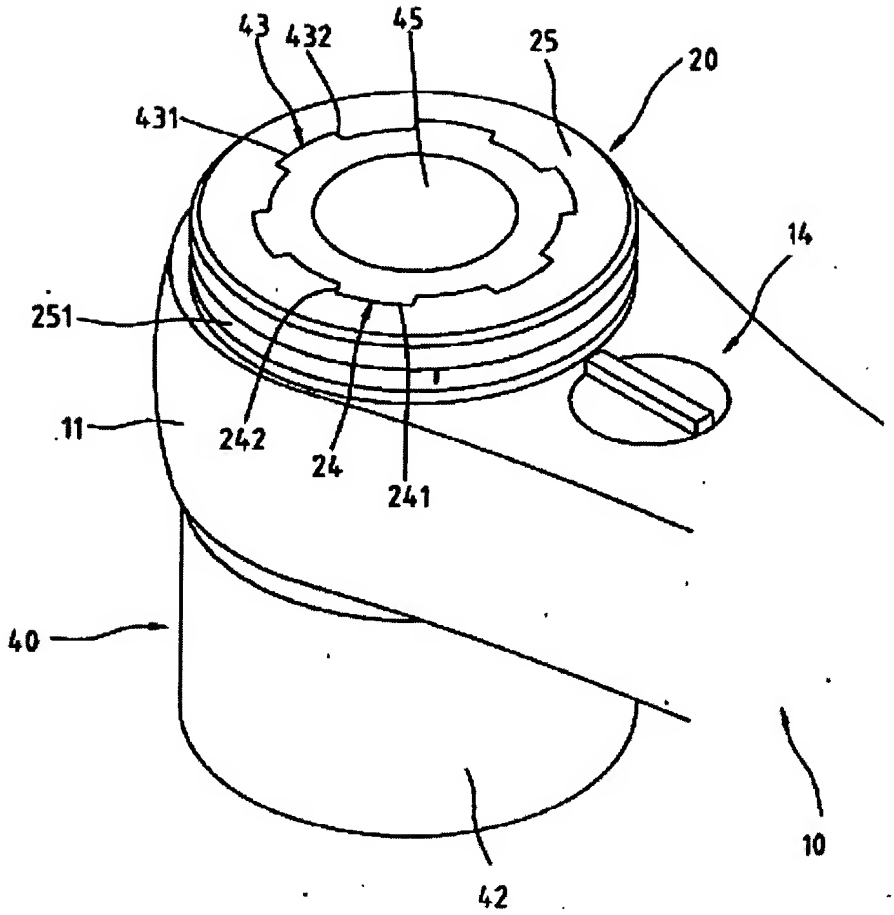

Figure 4

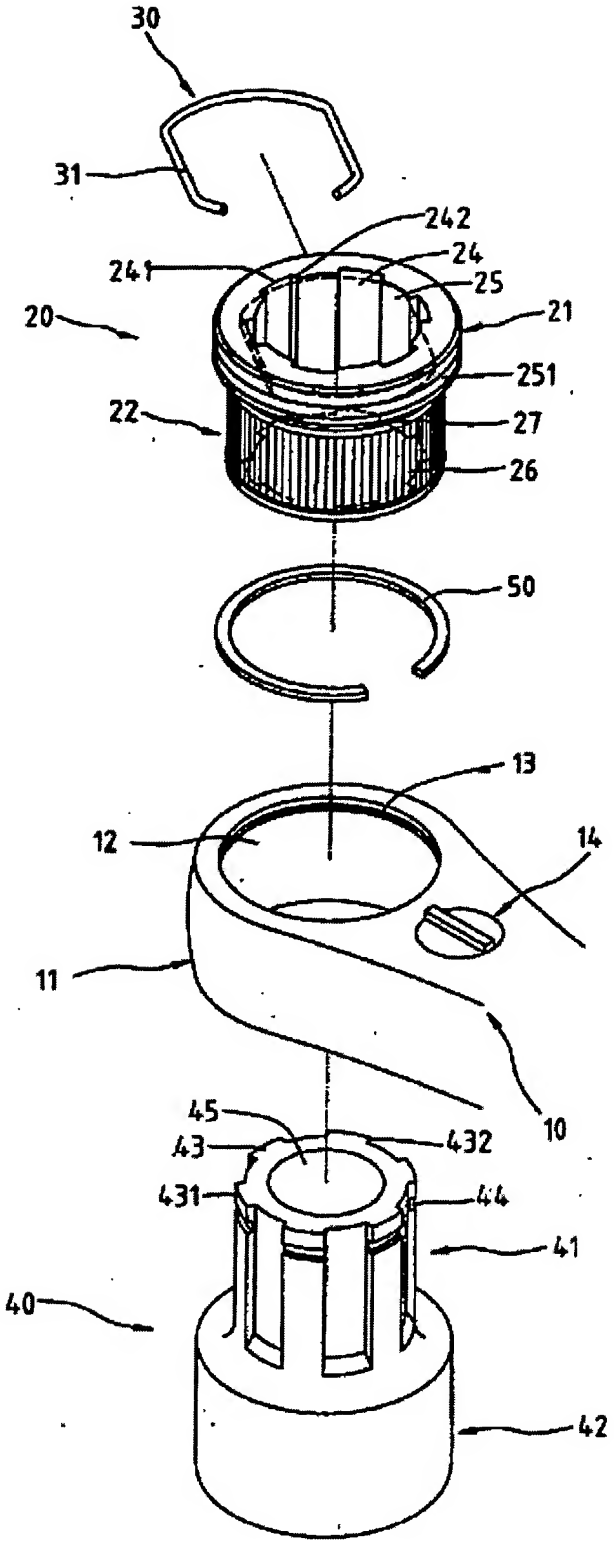
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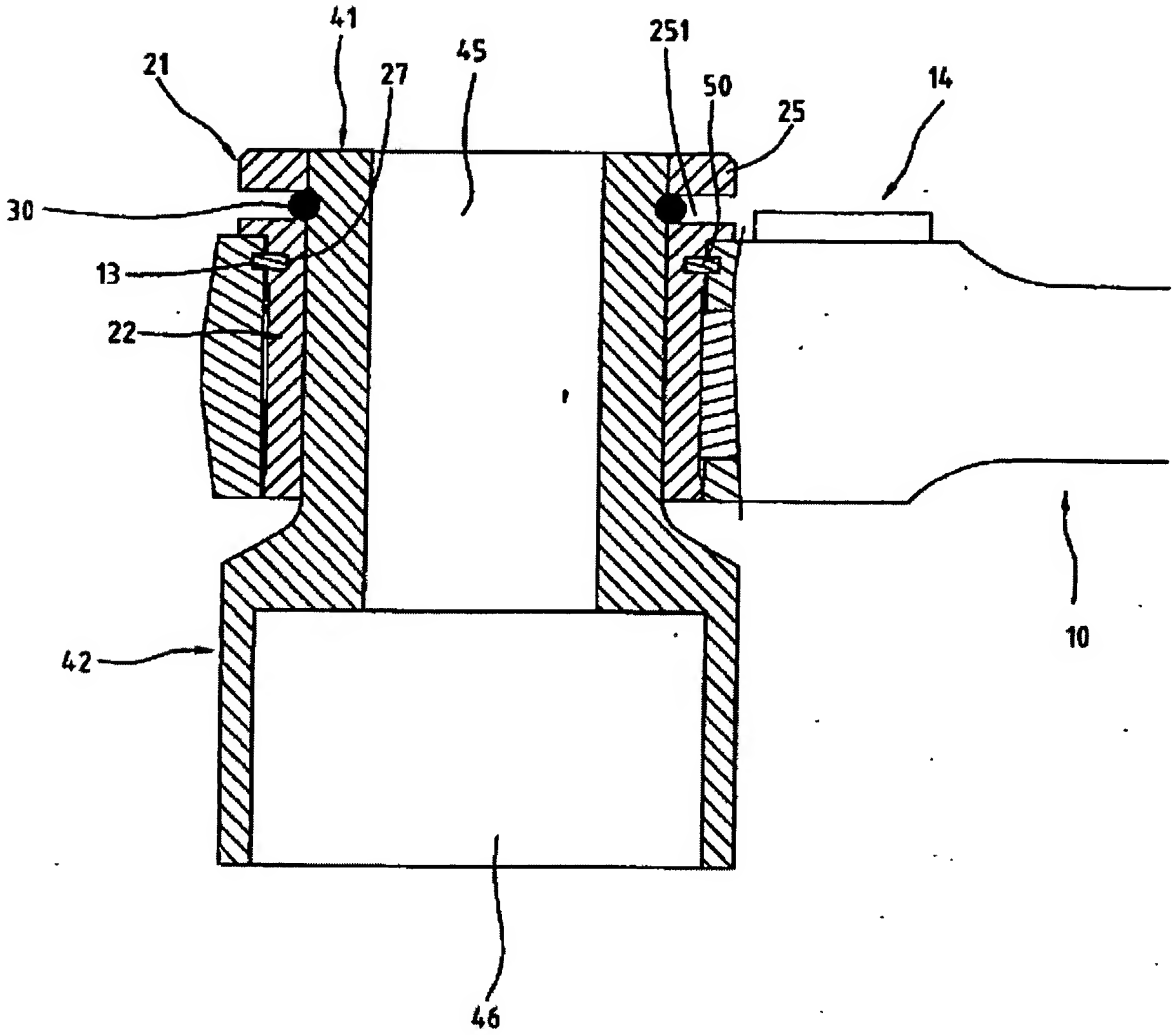
Figure 5



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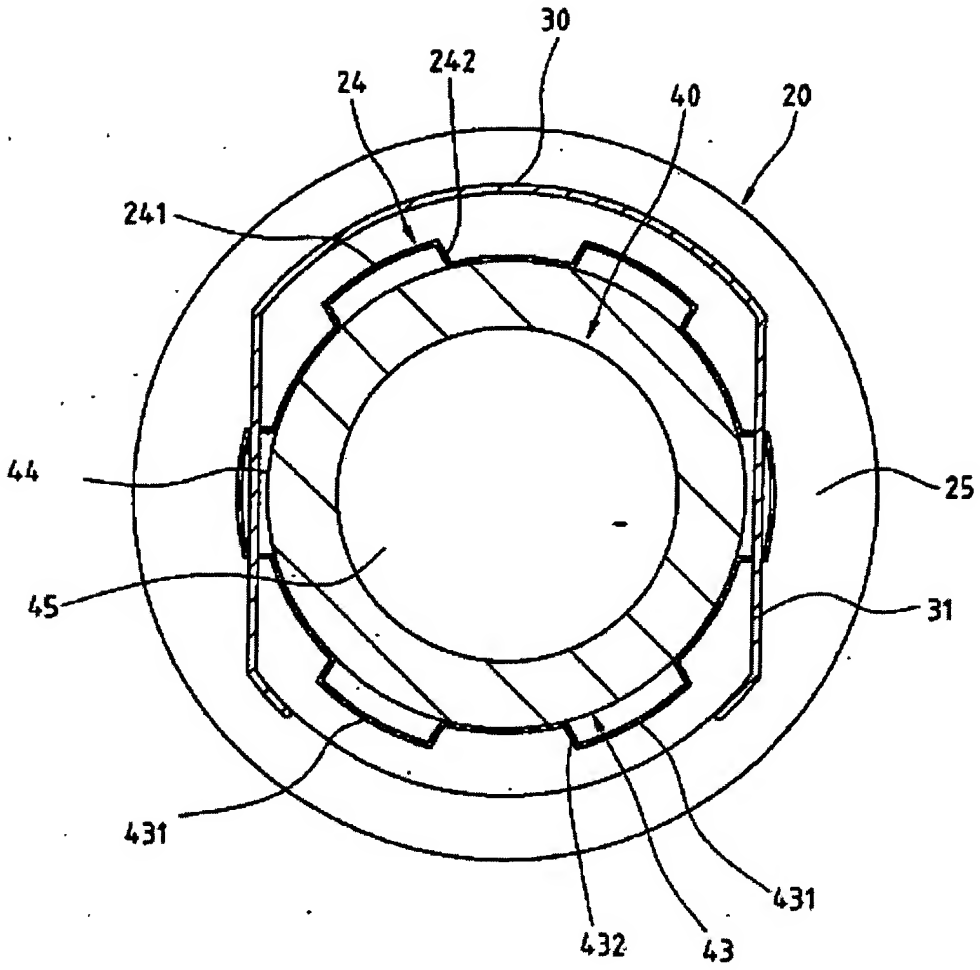

Figure 7

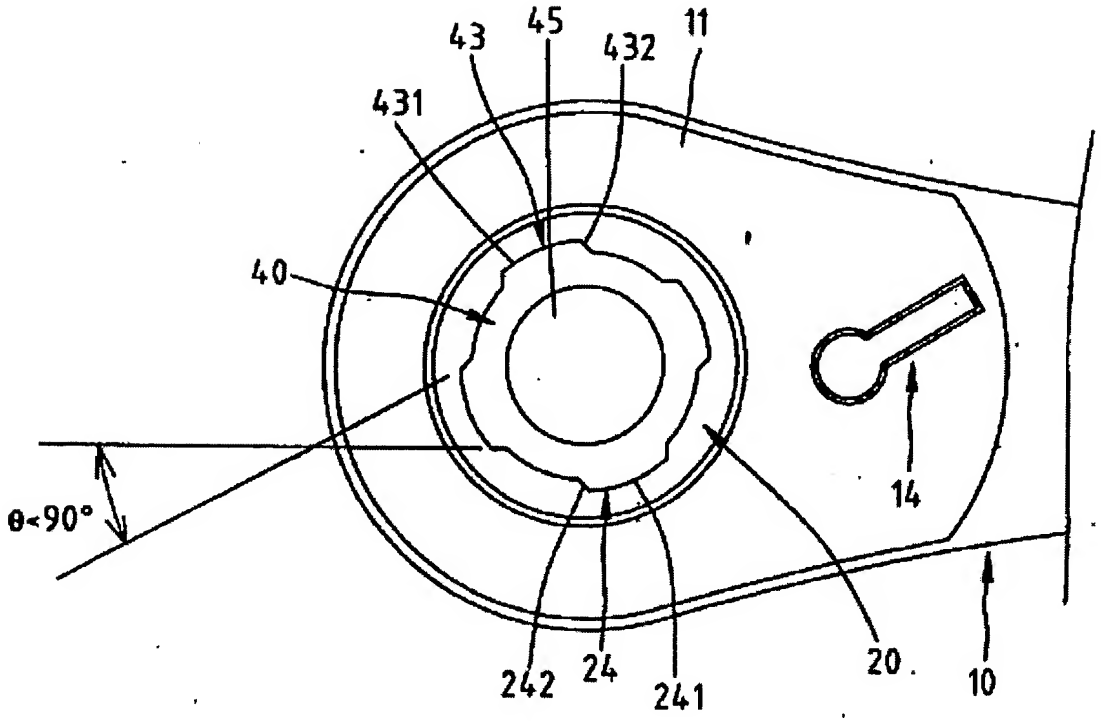

Figure 8

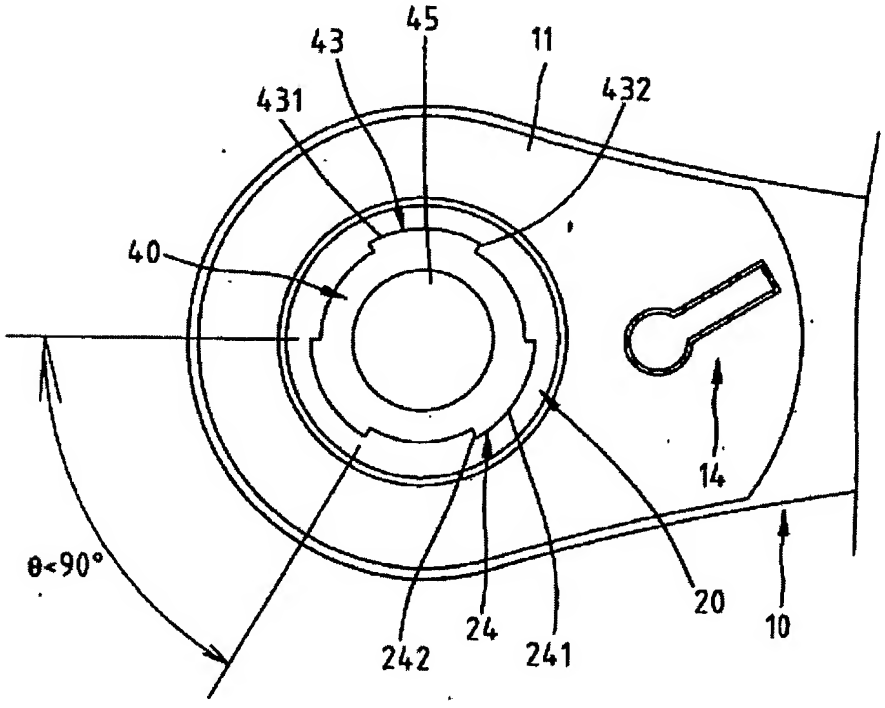

Figure 9

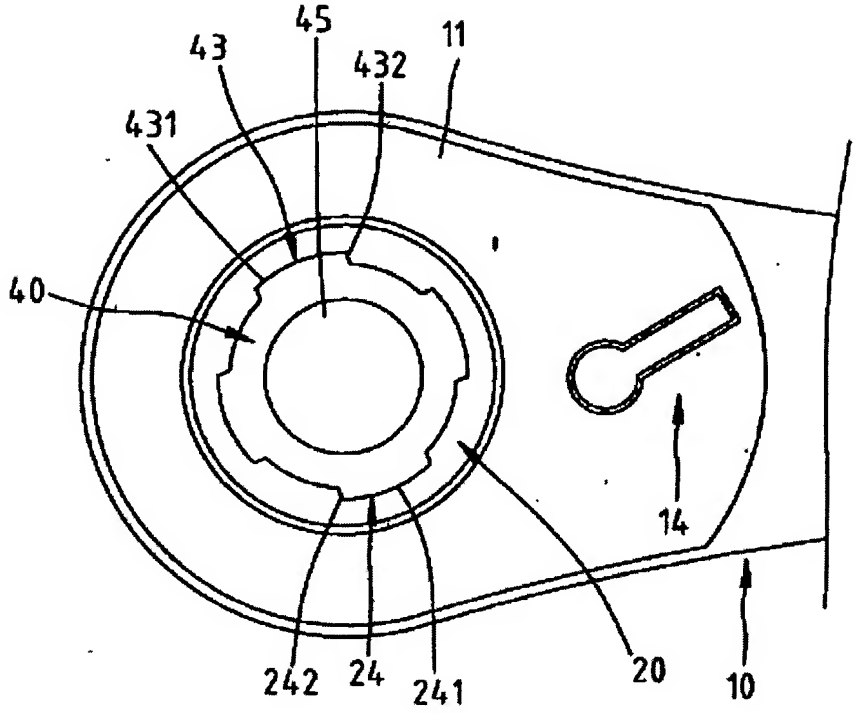

Figure 10

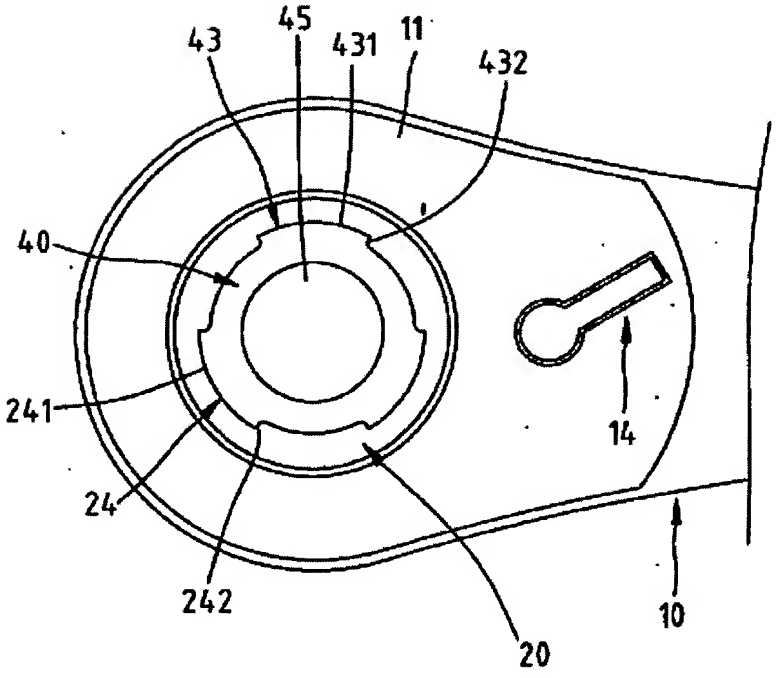

Figure 11

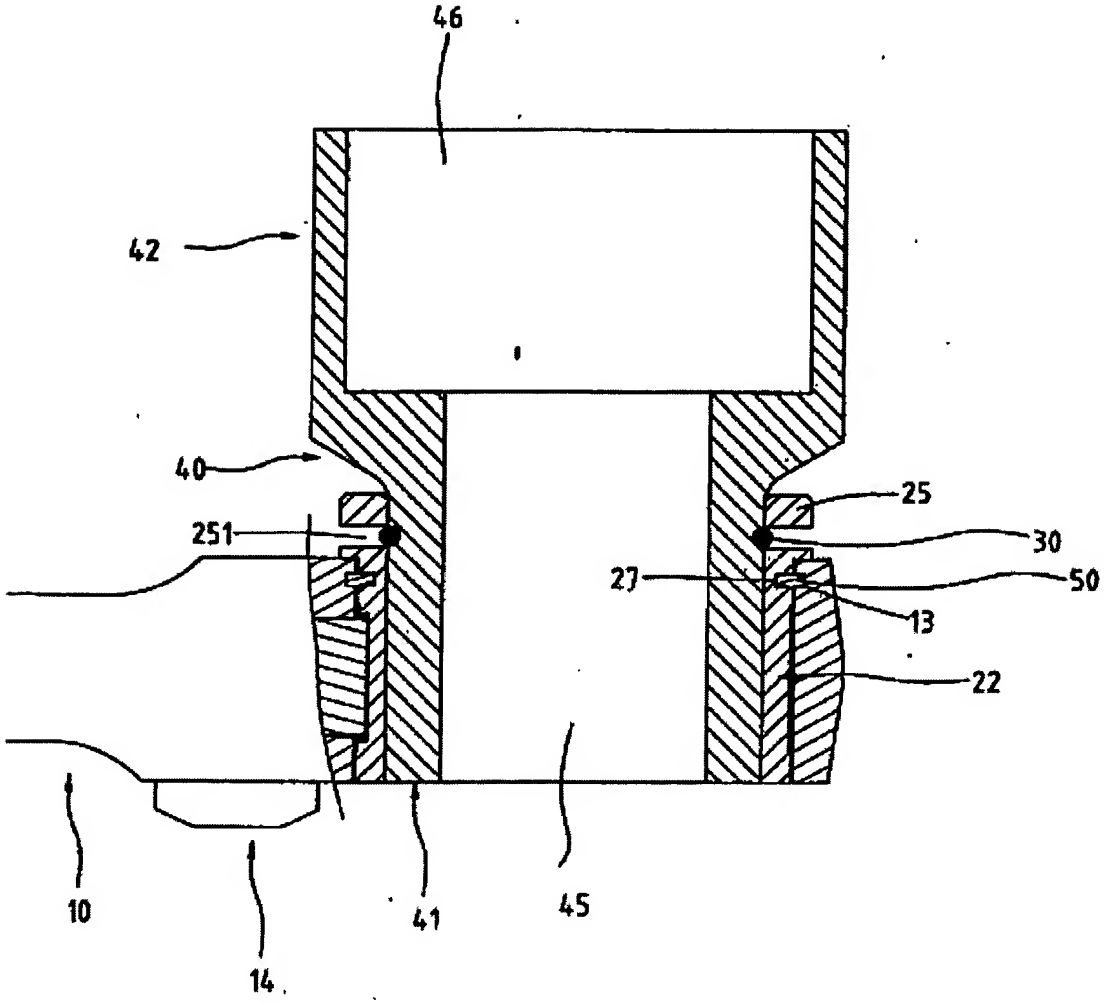

Figure 12